THE EXTENT TO WHICH VIRTUAL-REALITY SIMULATORS AND AUGMENTED REALITY SIMULATORS INFLUENCE INTERACTION WITH THE REAL WORLD

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ABSTRACT

Due to the advent of Augmented Reality (AR) and Virtual Reality (VR) simulators, the way in which society interacts with their surroundings and other people has transformed dramatically. VR and AR have been changing how people interact with the physical world, including the extent to which they need to interact with it in order to achieve a certain objective. The extent of AR and VR influences on human interactions with the real world are expansive, in both exciting and harmful ways. It is important to balance human involvement with AR and VR and not become distracted by a plethora of altered-reality opportunities, so that society at large can enjoy AR and VR with an optimum influence on interactions.

KEYWORDS: Augmented Reality, Virtual Reality, simulation, interaction, safety, balance.

INTRODUCTION

The Extent to Which Virtual-Reality Simulators and Augmented-Reality Simulators Influence Interaction with the Real World

According to Oxford Languages, VR is defined as "the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors". In many situations, VR is supplemented by audio, tactile, and olfactory technology to create a deeply immersive experience. Refer to Figure 1.0 for an example of an individual experiencing a VR simulator.

According to Oxford Languages, AR is defined as "a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view"; refer to Figure 1.1 for an example of individuals experiencing an AR simulator.

Mobile apps utilised to simulate virtual furniture onto a real space (AR)

This APA research paper aims to explain the extent to which VR and AR simulators have an influence on people's interactions with the three-dimensional world. VR has a range of applications including, but not limited to (Chi, 2018):
- Military training such as:
  - Flight simulation (as observed in Figure 1.0)
  - Simulation of driving vehicles
  - Combat simulation
  - Medical battlefield simulation
- Museum visits
- Immersive journalism
- Medical patient-therapy

AR also has a range of uses including, but not limited to, applications on mobile phones. AR and VR have a great influence on the way in which people interact with and perceive the physical world. Because of this transformation, mental health issues could become amplified because of the isolation that deeply immersive VR simulations bring, stemming from the fact that users may quickly grow dependent on such devices (Pennington, 2021). Although not immersive in the same way as VR, a case-study of the AR app Pokémon Go displays the physical dangers that could arise from consumption of altered-reality content (Roy, 2021). In a more optimistic light, AR and VR are being explored even in the realms of weddings in the metaverse; on the 6th of February 2022, a couple in Tamil Nadu hosted their wedding reception in the virtual realm because of COVID-19 lockdown limits (Livemint Editors, 2022). VR and AR are also changing the ways people express and preserve culture. It is apparent that the way in which people are using AR and VR may lead to a reduction in the necessity for in-person interaction. All these examples prove that altered-reality simulators are having a great impact on how people interact with the three-dimensional world, and will continue to do so.

Air Force personnel training in a simulated flight environment (VR)

Literature Review

Cheryl Roy (Roy, 2021) describes the harmful effects of augmented reality simulators on human health and safety. The example of Pokémon Go has been utilised as a case study for how interaction with the three-dimensional world changes - as a result of augmented reality software - has endangered the lives of many people and has also caused avoidable deaths.

Chapter 9 of Peter Riendeau's digital book titled Augmented and Virtual Reality: The Next Big Thing in Marketing? explains the causes of injuries connected to altered-reality simulators, affecting the ways in which people interact with their surroundings (Riendeau, 2017). Much of the information presented by this chapter of the book verifies information in the article written by Cheryl Roy.

In the International Journal of Engineering & Technology, four university professors (Nayyar, Mahapatra, Le, & Suseendran, 2018) explain how altered-reality simulators are playing a role in changing the tourism and hospitality industries. Such uses include, but are not limited to previewing destinations and accommodations in advance, "translating written, spoken signs or conversations", entertaining tourists, and navigating through unfamiliar regions.

Research Method

The research sources, all of which are secondary, have been found for this paper through specific keyword searches. Certain sources have been removed depend-

ing on a lack of author details, lack of specific publishing dates, lack of relevant information, and suspicious links. To ensure the presence of accurate information in the paper, sources have been cross-verified.

The Rise of Global VR and AR Users
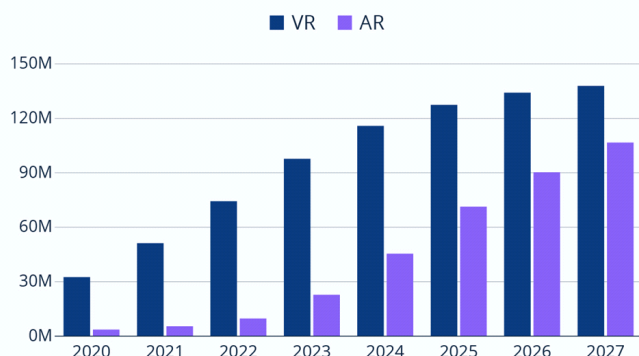
Figure 2.0

Although the global AR and VR users will not surpass the billions of smartphone users for potentially many decades, the number of VR and AR users has increased to 74 million and nearly 10 million respectively as shown in Figure 2.0 (Richter, 2022). According to Statista, "By 2027, both AR and VR are expected to have surpassed 100 million users worldwide" (Richter, 2022). This statistic indicates that the impact such simulators would therefore have is projected to increase; with an increasing number of VR and AR users, the interactions people and firms have with each other will see a higher dependence on simulators, hence garnering a significant influence on human interactions with the real world.

Heading 1: VR and AR is influencing how people move within their physical spaces. Using VR, people are able to traverse through simulations of imagined and real spaces which they otherwise would not get to experience in the real three-dimension world. Unfortunately, VR and AR are also leading to consequences for human safety because of the change in how people move around, influenced by simulators.

Posing threats to physical human safety: Although the human brain adapts to inhabiting a virtual space in VR, the physical body is still in the real three-dimensional world. This means people still face the possibility of being injured by something in their immediate surroundings. Doctors continue to see patients with injuries from "walking into real, visible objects, tripping over obstacles" or "losing their sense of balance due to VR scenes not matching their actual physical surroundings" (Riendeau, 2022/2017). According to a Tippecanoe County study done in 2015, the AR app Pokémon Go was linked to an increase in vehicular damage, injuries, and deaths; the study estimated country-wide costs to "range between $2 billion to $7.3 billion" (Lee, 2021).

Enabling otherwise inaccessible experiences: A vast availability of VR videos exist on YouTube ranging from outer space travel (Vicinity360, 2020), sit in a roller coaster (Theme Park Review, 2017), waterpark rides (3D VR 360 VIDEOS, 2017), and natural zones like waterfalls (ECOVR, 2017).

Heading 2: VR and AR is influencing culture in every way. Culture is defined by Oxford Languages as "the ideas, customs, and social behaviour of a particular people or society". Culture is at the centre of human interactions because it impacts how people approach their surroundings; since VR and AR simulation is altering the way culture is experienced, people's interactions with the three-dimensional world are inevitably greatly influenced.

Preservation and appreciation of cultural heritage. Popularised during the COVID-19 lockdown, virtual museums on Google Arts & Culture allow people to appreciate culture preserved in museums without needing to physically be present there. However, many ethical concerns have risen from the fact that simulated depictions of museums have been democratised (Leslie, 2022).

Transformed entertainment. There exist AR mobile apps which allow users to 'raise' augmented pets, such as 'AR Dragon'. VR interfaces provide users access to games which can be played with just a headset and two handheld controllers, such as 'Beat Saber' and 'Tetris Effect'. VR is starting to allow users to watch movies in a simulated cinema environment, which means that they do not need to interact with particular physical-spaces to enjoy different types of entertainment.

Changing in-person interaction. The rise of AR and VR in the fields of education, real estate, fashion, and workforce training has reduced the need for people to meet in real life with the purpose of achieving a given objective. The virtual wedding in Tamil Nadu, India (Livemint Editors, 2022) is a clear example of how, even without the ability to meet other people in real life, people attended the ceremony; the bride's deceased father also appeared in a simulated form, which allowed the bride to have a surreal experience that would otherwise not have been possible without VR. However, this reduction in human interaction as a result of AR and VR has negative impacts on human wellbeing. According to a 2015 study co-authored by psychology and neuroscience professors (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015), "actual and perceived social isolation are both associated with increased risk for early mortality". The inherently isolating natures of AR and VR appear to be directly linked to this risk. The degree to which humans decide to use altered-reality simulators should therefore be carefully tracked to ensure a healthy balance between enjoying their benefits and going out to interact with others themselves.

Conclusion

To conclude this research, AR and VR have been influencing the way in which we have been interacting with the world in multiple ways. By 2027, more than a total of 245 million people will be using AR and VR worldwide; ~145M VR users and ~105M AR users. Both these simulators have enabled us to take large strides in the large-scale innovation of daily life; from providing enhanced entertainment to being a cause of human injury, the range of impacts that AR and VR have had shed light on the need to pace the contact we have with the simulators so that their impacts on our interactions with the world remain as productive and enjoyable as possible.

REFERENCES

1. 3D VR 360 VIDEOS. (2017, December 22). Best VR 360 Video (Virtual Reality). Retrieved December 4, 2022, from www.youtube.com website: https://youtu.be/QKm-SOOMC4c
2. Chi, C. (2018, October 7). 11 Virtual Reality Apps That You Won't Be Able to Put Down. Retrieved November 30, 2022, from blog.hubspot.com website: https://blog.hubspot.com/marketing/virtual-reality-apps
3. ECOVR. (2017). Virtual Nature 360° - 5.7K Nature Meditation for Oculus Quest. Retrieved December 4, 2022, from YouTube website: https://youtu.be/7AkbUfZjS5k
4. Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and Social Isolation as Risk Factors for Mortality. Perspectives on Psychological Science, 10(2), 227–237. Sage Journals. https://doi.org/10.1177/1745691614568352
5. Lee, K. (2021, January 12). Death by Pokémon Go. Retrieved December 7, 2022, from Business Insider website: https://www.businessinsider.in/thelife/news/death-by-pokmon-go-study-finds-that-driving-while-playing-likely-cost-billions-in-cardamages/articleshow/80220467.cms#:~:text=%22Specifically%2C%20a%20difference%2Din
6. Leslie, S. (2022, May 6). The Key Role of VR in Preserving Cultural Heritage. Retrieved December 6, 2022, from Arts Management & Technology Laboratory - Carnegie Mellon University website: https://amt-lab.org/blog/2022/4/motivating-usages-of-virtual-reality-in-cultural-heritage
7. Livemint Editors. (2022, February 7). Tamil Nadu Couple Holds India's First-of-its-Kind Wedding Reception in Metaverse. Retrieved December 3, 2022, from mint website: https://www.livemint.com/news/india/tamil-nadu-couple-holds-india-s-first-of-its-kind-wedding-reception-in-metaverse-watch-here-11644226513762.html
8. Nayyar, A., Mahapatra, B., Le, D., & Suseendran, G. (2018). Virtual Reality (VR) & Augmented Reality (AR) Technologies for Tourism and Hospitality Industry. International Journal of Engineering and Technology, 11(2), 156–157. Science Publishing Corporation (SPC). Retrieved from https://www.academia.edu/download/61827146/IJET-1185820200119-129462-1xdqt7y.pdf
9. Pennington, A. (2021, August 8). What's the Societal Impact of VR? Retrieved November 30, 2022, from NAB Amplify website: https://amplify.nabshow.com/articles/whats-the-societal-impact-of-vr/
10. Richter, F. (2022, October 14). Infographic: AR & VR Adoption Is Still in Its Infancy. Retrieved December 16, 2022, from Statista Infographics website: https://www.statista.com/chart/28467/virtual-and-augmented-reality-adoption-forecast/
11. Riendeau, P. (2017). Augmented and Virtual Reality: The Next Big Thing in Marketing? In pressbooks.pub (Vol. 1). Montreal, Canada: Pressbooks. Retrieved from https://pressbooks.pub/augmentedrealitymarketing/chapter/risk-and-arvr/#:~:text=The%20effect%20can%20be%20that
12. Roy, C. (2021, January 21). What are the Harmful Effects of Virtual Reality? Retrieved December 1, 2022, from Law Technology Today website: https://www.lawtechnologytoday.org/2021/01/what-are-the-harmful-effects-of-virtual-reality/
13. Theme Park Review. (2017, August 19). VR 360 The Beast World's Longest Wooden Roller Coaster. Retrieved December 4, 2022, from www.youtube.com website: https://youtu.be/p0hAcQTv21o
14. Vicinity360. (2020, November 9). 360° VR Spacewalk Experience | BBC HOME. Retrieved December 4, 2022, from www.youtube.com website: https://youtu.be/hEdzv7D4CbQ